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SPECIAL ISSUE ON PEER-TO-PEER AND USER-LED SCIENCE

Social network science: pedagogy, dialogue, deliberation

Richard Watermeyer

ABSTRACT: The online world constitutes an ever-expanding store and incubator for scientific information. It is also a social space where forms of creative interaction engender new ways of approaching science. Critically, the web is not only a repository of knowledge but a means with which to experience, interact and even supplement this bank. Social Network Sites are a key feature of such activity. This paper explores the potential for Social Network Sites (SNS) as an innovative pedagogical tool that precipitate the 'incidental learner'. I suggest that these online spaces, characterised by informality, open-access, user input and widespread popularity, offer a potentially indispensable means of furthering the public understanding of science; and significantly one that is rooted in dialogue.

Formal and Incidental Learning

The life of the social actor is knowingly or unwittingly, determined by a process of continuous learning. Taken another way, meaningful learning occurs through social interaction.[1] Such learning is in part conscious effort based on individual choice, proclivity and aptitude. This type of learning is typically characterised by formal, intended and highly strategised forms of pedagogy, where knowledge transmission is the core ambition. Knowledge laboratories are generally populated by two types of educational actor: the learner and teacher. These two are polarised by a respective paucity and abundance of knowledge specific to the subject area or specialism. Yet with positive interaction, sharing and problem solving, strands of knowledge emerge which bridge this divide and slacken the disequilibrium of expertise, reconstituting the educational actor. Of course, both learner and teacher follow a course of continuous development, and are as such both committed to a dialectic process.[2] The potential for this is determined by the fluency and efficacy of the learning contract; the relationship forged between teacher and learner, and learner and learner.

Socialization is an important aspect impacting upon the educational experience and more importantly the determination of the learner's subjectivity.[3] A multitude of factors: social, cultural, economic and political, impact upon the learner's maturation and the attribution of formative identity.[4] The diversity of formal education - its variety of institution, myriad of pedagogy, heterogeneity of participant (and his/her cultural milieu) reflects the wider social realm. Concurrently, forms of inequality, prejudice and discrimination that inhibit and arrest the ideal of democratic participation may emerge.[5] In this context, the provenance and pursuit of knowledge appears less equitable. Knowledge instead sequesters, coagulates and is traditionally owned by those with the greatest social and economic advantage.[6]

The active citizen, in exercising his or her democratic right, is obligated to a continuous learning process evinced in the everyday and ordinary exchange of ideas, understanding, opinion and knowledge.[7] The dialogical interaction shared by two people is evidence itself of the dissemination, exchange and (re)production of knowledge. In event, learning occurs, though is perhaps not immediately obvious. Through a range of communicative mediums: simple conversation, image or print, individuals construct a sense of their own subjective world with its associative network of meanings, or as Piaget[8] argued 'intelligent adaption' based upon 'accommodation' and 'assimilation'. Adaption that occurs naturally or without conscious effort, forms what we might call incidental learning or what Rogers[9] refers to as

acquisition learning: the unintentional accrual of knowledge and practice of learning. Acquisition learning may be taken as knowledge gleaned indirectly in the pursuit of non-learning directed/based activity. It occurs unintentionally, invisibly or by osmosis. Acquisition learning is not officially sanctioned or organised. Instead it is a by-product and parallel process of the socially active, democratically participative citizen. This model suggests that learning occurs most successfully not in isolation, not through singular uni-directional or unilateral accounts, but through immersion in a multi-layered matrix of diverse social repertoires. This essentially, is a model of social learning whereby individuals accrue a sense of themselves and their world by being receptive, tolerant and co-operative with a multitude of social experiences. As John Dewey[10] remarked:

> We never educated directly, but indirectly by means of the environment.

The communication of science then, beyond a traditional audience requires active, user-led engagement, which aspires to and enacts a democratic principle to,

> … be treated not merely as objects of legislation, as passive subjects to be ruled, but as autonomous agents who take part in the governance of their own society.[11]

A fuller, more leading role for non-specialists in science has occurred with shifts in the conceptualization of the 'public understanding of science'.[12] The focus on higher levels of public understanding of science prevalent in the 1980s, shifted in the 1990s to a public engagement with science, which persists as the dominant approach.[13] What is referred to as 'upstream engagement'[14] does not however imagine the public as overly instrumental or interventionist but as building reflective capacity in the practice of science.[15] In this respect specialists and non-specialists may enact new conversations as the role of scientist as public citizen is induced and magnified. Digital, computer assisted and online forms of communication may offer not only an inexpensive but empowering means for specialist and non-specialist to interact and for creative, dialogical learning to occur.

This is the basis of the autonomous, self-regulating and self-directed learner, responsible for the recasting and recalibration of a knowledge continuum beyond the imposition of proscriptive learning models.[16] For truly effective learning to occur, the learner must take precedence and assume central control in negotiating his or her learning experience and the formation of learner identity. This demands not only an ability to successfully integrate into a learning community but a receptivity to novel, unexpected and unintended experiences.[17]

I address in this paper the extent to which public engagement with science may be improved by harnessing the technologies of Web 2.0. I consider the potential for web-based technology in capturing dialogue between scientists and non-scientists and as a source of incidental learning. The paper asks: are social network sites a viable means for the production of scientific knowledge that unites both scientist and non-scientist? Or, does promissory narrative over-inflate expectations or prematurely suppose solutions, thereby invoking public disappointment or apathy? As a key theme for discussion, I consider the popularisation of science, and how initiatives for fuller public involvement may ultimately impede and compromise scientific progress and its impact for the greater public good.

In both formal and incidental educational settings, from the classroom to leisure magazine or television show, scientific expertise undergoes translation[18]. Science communicators and science journalists are charged with translating highly technical concepts into lay terminology, allowing the uninitiated to better grasp the intricacies of the otherwise obscure and inaccessible. Unfortunately, many of these, especially science journalists, have suffered the scorn and derision of both lay and expert publics who accuse them of 'dumbing-down'. In so doing they are seen to condescend a 'deficit' public, or of misrepresenting, inaccurately translating, and changing the meaning of science.[19] This arguably is the consequence of a hybrid role of unequal parts, with the suggestion that the science communicator is more skilled as communicator than scientist. Nevertheless, we may surmise that there are many highly-skilled science communicators, whose translation is faithful and accurate to scientific knowledge. The potential for honest reportage arguably hinges on the capacity of both scientist and communicator in negotiating the public dissemination of scientific knowledge.[20] In this context, translation may be conceived as more about carrying-across meaning than changing the sense of words.

Both communicators and journalists are types of intermediary, intended to assist scientists for whom communication to lay audiences may be unaccustomed and difficult. This is based on a widely held belief

that scientists are too far removed from the general public and are as much alienated from the public as the public are from them. This is seen to correlate to a growing public mistrust of science and scientists, and a pressing need to not only integrate the two groups in common dialogue, but allow the public as research users to contribute in the discussion, deliberation and generation of new forms of scientific knowledge.[21] In this instance, the public becomes not only a research user or consumer of scientific knowledge and discovery, but an active learner and thus contributor to scientific debate.

For learners to be mobile and active, science should not appear alien, out-of-reach, opaque or more worryingly uninteresting but approachable, dynamic and accessible on the user's terms. Science must therefore in a sense be made available universally; echoing Dewey[22] who claimed,

> … the business of education might be defined as an emancipation and enlargement of experience.

The question thus arises, how best to make available, to entice and sustain interest? In essence, scientists or science educators must ask how best to engage. The work of science communicators and journalists remains valid and important yet, there is a distinct sense that the audience for both of these is limited and largely based on those with a prior or fledgling interest. In such case the education of science remains largely a business for the educated. What then for those marginalised from formal or incidental forms of education? Arguably, a medium and space where individuals can congregate safely and with assurance, perhaps with anonymity and distance, is necessary. Furthermore, such a space might be populated by the gentle and gradual introduction of science. To bombard new learners with science from the outset might ultimately dissuade or repel individuals from participating. Instead a drip-feed of participative exercises between scientists and non-scientists might more successfully stimulate a learning partnership. The Social Network Site (SNS) is such a space, where science may become conversational, collaborative and communal, yet arguably unwittingly so.

Frequently public interaction with science and scientists occurs in a cursory or arms' length fashion[23] or when stigma and controversy induce public curiosity.[24] Clearly, public negotiations of science are context specific with varying degrees of interest and involvement. Nevertheless many users of new technology, principally new media and Web 2.0, are adept users, able to skilfully manipulate an array of hardware and software in different ways; and in doing so elicit new interpretations and meaning.[25] Nevertheless there remain those who bemoan the technicalities, complexities and expert nuances that accompany the discourse of science, which they complain render it indecipherable and alienating. In such cases the specificity of what is meant by science in the public understanding of science becomes critical.[26] The oeuvre of science must be located and remain context specific. Attribution of wholesale ignorance or illiteracy of science to a 'deficit' public is inaccurate and inhibitive. Indeed studies have shown that non-scientists often have nuanced and contextualized knowledge, helpful yet absent from the 'laboratory'.[27]

The Social Network Site (SNS)

Educators have recently begun to pay attention to the increased popularity, indeed ubiquity, of social network sites and their users.[28] Research has examined the extent to which SNS provide a viable addition to formal means of education, not least in building dialogue within a learner community. There are however fears that the incorporation of SNS might occur as a wholesale replacement for structured learning, and that the development of core skills and competencies, found in traditional educational settings, formal and for that matter incidental, will be neglected.

The SNS is a peculiar space in so much as it generates an online community of dialoguers not as easily realisable in an offline sense. This in part is due to the imaginary quality of online subjectivity, which like the avatar is a fictionalised, sometimes exaggerated and improbable portrayal of the offline self. Such imaginary subjectivity provides the online learner flexibility and contingency, unattainable offline, and critically, from the perspective of science education, an entrance point. Actor-network theory is potentially useful in considering how types of online networks are permanently transient. The actor-network is perpetually a process of making and unmaking meaning.[29]

Theoretically at least, SNS offer a space for self-reflection that enriches the learning experience. SNS is characterised by an enhanced mobility which circumnavigates the potential entrapment of the physical classroom with fluid walls, inverted hierarchy, multiple peer groups, perspectives and co-created as opposed to didactic learning. Furthermore as an online classroom, SNS boasts a range of media

technologies, enabling the incidental learner to better articulate and make sense of new forms of knowledge.

SNS are most profitable as a resource for scientific learning, not least because of their popularity as a means of cultural expression. Individuals increasingly recruit the various applications of SNS to express themselves, no matter how faithfully. Furthermore, such self-presentations are constant, instantaneous and available to a global audience. SNS are representative of global connectivity and the harnessing of international perspectives, be they economic, social, cultural or political, which are always current and up-to-date. Traditional research-led teaching might only dream of the speed by which recently mined forms of knowledge are channelled into official curriculum. There are however, justifiable concerns surrounding the accuracy and consistency of science in an open access, web-based format.[30] The reliability of information generated in such ways is questionable not least when the production and use of knowledge is motivated and influenced by political or personal interests. In this context information may not only misguide but misrepresent and malign knowledge accounts.

Commentators argue however, that SNS might actually precipitate heightened disengagement from individuals' local contexts. This, placed in the light of formal education, may seem to be ever more dangerous, certainly in the development of embryonic or early learning and the development of core, 'traditional' skills and literacies. What Vygotsky[31] terms as the 'zone of proximal development' may in such instance deteriorate, as immediate relationships with teachers or more able peers dislodge and dissipate. This ultimately collapses the 'scaffolding'[32] critical in the development of early learner identity and interaction.

The usability and friendliness of Web 2.0 applications are cause not only for widespread use and popularity but the mutation of traditional forms of communication and modes of social interaction. Technological science in a sense is redrawing the manual of what it is to be a social being and how we learn to construct, in a Goffman sense,[33] a subjective background that facilitates an out-facing exhibition and presentation of self.

The ascent of Web 2.0 technology may be homologous to what Ziegler[34] describes as the 'miseducation of Generation M'. As the online citizen assumes greater precedence and the offline citizen is slowly retired, critics argue the individual becomes penumbrous. Web 2.0 is not so much an extension of powers to communicate knowledge but the core and culmination of such ambitions. In this way, scientific technology orchestrates a subjective inversion as online identity assumes greater authority and 'authenticity' over the ersatz offline. As such, Web 2.0 demonstrates how science accommodates for the inadequacies or shortcomings of social enterprise, yet arguably does less to facilitate human ability to handle and manage transitions in knowledge, instead enervating capacity for independent and autonomous learning and knowledge.

Brabazon[35] rails against a 'Google' generation of learners that are incapable of independent thought. Ziegler[36] argues that SNS cultivates a type of learner who, so used to instantaneous outcomes, is unnerved and arrested by events, which require deliberation, problem solving and critical thinking. The SNSer is thus marked by a lack of concentration. Sigman[37] takes a critique of SNS to a biological level arguing that a lack of real-life, face-to-face contact is associated with physiological changes; increased incidence of illness and higher premature mortality.

There exists however an ardent, if minority, cohort of educationalists promoting the potential of Web 2.0 as groundbreaking and transformative.[38] Many of these have identified in Web 2.0 and its associative 'social software' new possibilities for educational application, via an assortment of group interactions.[39] These argue that Web 2.0 offers an available, abundant and attentive audience, albeit one whose primary and/or sole rationale as user is not explicitly educational. Nevertheless there would seem vast potential to exploit a ready, captive and populous audience of 'ordinary' and non-expert internet users, who coalesce by the millions and whose social interactions evince unknowingly, types of learner and forms of learning.

SNS such as *Facebook*, originally designed as an electronic yearbook, provide a unique window onto academic life for existing students, prospective students and faculty of Higher Education Institutions (HEIs). *Facebook*, acts as a spotlight on the day-to-day of the university, which with 'its combination of self presentation, prurient viewing of others' personal information and situational relevance to campus life has certainly proved attractive to students users'.[40] SNS such as *Facebook* and *Twitter* may offer a point of entry and explication, a continuous commentary and in many ways a contribution to the social and cultural characterisation of HEIs. They offer a unique and highly accessible reach, which is critically

at arms-length; and as Stutzman[41] concludes, 'a highly interactive way to explore this new space'. The same surely can be said not only of institutions' subject areas and specific faculty but in this case science.

SNS space complements the situational setting and orientation of Higher Education, in that it offers critical reflection, peer consultation, collaboration and feedback.[42] It mimics or favourably compares with what have come to be seen as good pedagogical approaches, which stress the collaborative, communal and participatory as learning essentials.[43] *Facebook* thus offers a means for students to grasp, (re)construct and form consensus on their encounters with knowledge and consolidation of their learner identity.[44] It may promote through open interaction, critical deliberation and unexpected outcomes, not found in the classroom. Perhaps most especially, it gives students a voice, uninhibited or unaffected by university hierarchy, characterised by students' deference to their professors and the fear of speaking out in class. Nevertheless the perceived openness of students in airing their views of their tutors and courses-of-study, and in determining their own place within this, tend in many respects to correspond to the offline classroom in so much as the presentation of self remains largely unaltered.[45] Peer group interaction evidenced in SNS demonstrates the same hesitancy to fall outside of the consensus, and in many respects replicates the same kind of stereotyping and prejudice found in the offline classroom. Suggestions that SNS may liberate learners from traditional brackets of identity are in Selwyn's example largely unrealised. Indeed if anything, learner identity tends to be further reinforced and embedded. In this way the potential for the learner to evolve beyond the social parameters of the group becomes ever harder as SNS intensifies the need for the learner to be seen to conform.

Selwyn's[46] study of undergraduate students in a UK Russell Group university, demonstrated that undergraduates' self-portrayal failed to deviate from their offline personalities, and the same learner typology that distinguished keen learners as 'swots' remained intact. Nevertheless *Facebook* was shown to offer an important space for identity politics and the informal, unofficial determination of subject knowledge away from the gaze of university authority. However this sanctuary has been compromised by incautious though unintended broadcast, making known types of activity or sentiment censured by university authorities, sometimes with disastrous consequences.[47] It occurs therefore that the autonomous learner should observe and accept responsibility and due consideration for their learning and the wellbeing of themselves and their peers, especially when self-broadcasting in highly public spaces such as SNS. This raises questions as to how much can be accepted of certain types of learner, particularly juvenile learners, and the need for such online learning to occur with regulation. Whilst the critical thinking of the learner may be the ultimate ambition of university teaching, this is not always immediately realisable from a single approach nor without sustained guidance. There is every possibility that SNS, as an educational space, which is overtly *laissez-faire*, organic, self-directed, self-governing and non-hierarchical may easily lose or misalign students from their learning trajectories. The informal, non-educational aspects of student discourse may serve to not only dilute but entirely subsume any educational content, thus completely alienating students from positive learning pathways. Nevertheless, to think all SNS dialogue between students is prosaic, anti-intellectual and haphazard is exaggerated. Selwyn[48] found instances of student invention and enterprise when using *Facebook* effectively as an educational tool. Such instances were marked out as 'substantive peer-assisted learning' and tended to occur amongst second and final year students, pointing towards a scale of learner maturity. Nevertheless Selwyn[49] claimed that instances of co-operative learning such as this were largely isolated. Whilst SNS such as *Facebook* may replicate and in some instances reinforce learner alienation, their significance as a source of 'meaning-making' and identity formation cannot be ignored; nor can their popularity. As sites of recollection and (re)construction of knowledge, deliberation, contestation and affirmation, SNS form arguably the pre-eminent vehicle for those in formal education to informally or incidentally engage in learning. As Kitto and Higgins[50] point out, the global permeation of SNS is raising massively important questions in relation to teaching and learning and the way learners interact with expertise.

Pitfalls, Problems and Possibilities *2.0* and 'Medialization'

The focus here has been on those in the formal education of science, yet one of the advantages of Web 2.0 is that it aspires to be fully democratic, universal and open to every type of user, with or without credential or specialist skills, within and outside institutionalised education. In this way, the web has been transformed from a repository of knowledge meant for reading, to a knowledge generative space, pregnant with user content. Web 2.0 has potential as a springboard for developing dialogue and

deliberation that contest and construct representations of science, as it evolves from isolated web browsing and static knowledge to collective, participatory accounts.[51] The multiple representations of scientific knowledge that emerge from SNS however complicate its potential as a knowledge laboratory.

There are many fears associated with user generated content. Arguably, of greatest concern for scientists are inaccurate or biased representations of knowledge. *Wikis*, *blogs*, social network sites and so forth, they might recommend, should be used judiciously. This is however not always the case. Some learner groups are conspicuous for their impetuosity in assuming total confidence in the authority of knowledge ports such as *Wikipedia*. This abandon to misplaced trust, typifies the pages of written assignments, which as exercises in verbatim denote an abject scholarship.

The ubiquitous availability of user content can furthermore be seen as deterring active scholarship as easy retrieval breeds a culture of incurious and pampered knowledge worker. Web users are advised to be more prudent and selective in their negotiation of mediated knowledge. There should be less automatic 'by-in' to media portrayals and constructions of knowledge, and greater effort in filtering unfaithful and misguided accounts, thus avoiding the perils of Ziegler's[52] Generation M. In a digital age, there is increasing evidence to suggest that the active citizen is a skilled consumer of knowledge, able to interact, converse and negotiate with diverse and multiple media in the assemblage of meaning.[53] Increasingly skilled, and multi-media adept, navigators of knowledge manage to counter and extend, with varying success, what Weingart[54] describes as the 'medialization' of science - the extent by which coverage of science has extensified, pluralized and become more controversial. Outside formal modes of science education, exposure and uptake of science occurs predominantly through the mass media. To begin with, it is argued that the dissemination of science and science-related issues via media outputs such as science magazines and television programmes has massively expanded and with this wrought a near saturation of image[55], firmly placing science in the public eye. Following on, science coverage has pluralized, become more 'egalitarian'[56] and diverse, in that actors other than scientists are present in media accounts. In some ways this reduces the authority of the scientist and in others, the legitimacy of lay publics or non-experts in contributing to the production of scientific knowledge.

SNS can be seen as achieving both the extension and pluralisation of science coverage by enlisting ordinary, non-expert and democratic citizens in scientific debate. Critically this occurs as the result of science being presented as controversial. That which is presented or perceived as laden with stigma, or sensation is most likely to occupy centre-stage, albeit if only fleetingly, in the public eye. Coverage of cloning, genetically modified food, stem cell research and nanotechnology become prevalent in public discourse, yet as with all media events are cyclical. SNS in one sense, support dominant media accounts, yet in another provide a necessary critique of them. SNS provide therefore an important critical space for the public discussion, deconstruction and de-stigmatising of science. Furthermore the multiple perspectives that emerge from the plurality of actors populating SNS, contribute towards a community-of-practice, where individuals congregate in pursuit of a common activity and specific area of knowledge. This forms a type of 'situated learning'[57] where often, disparate actors combine to develop identity and particular practices that offer commentary and critique on scientific events and issues.

Adapting Lave and Wenger's[58] concept of 'legitimate peripheral participation', I suggest that SNS users become better acquainted and more able to negotiate forms of scientific knowledge as their relationships and position within an online community focused on such debate matures. Fuller understandings of science thus occur as SNS users become increasingly integrated into the language, skills and discourses of online communities.[59] This raises concerns however as to the extent to which online communities are predisposed to a social hierarchy and the replication of offline prejudice and inequity. Power relations and tensions, repeated and sometimes reinforced in the online world are perhaps an inevitability.

Arguably the great contribution or asset of SNS is the propensity for the collection of multifarious publics, joined in common activity. The extent to which this is designed or unintentional depends, it would seem, on the character and identity of the SNS. There can exist a generalist SNS population that comprises many smaller niche interest groups. *Facebook* members, for example, establish a community that is made up of many different subgroups. This reflects the social diversity and eclecticism of the offline world, where individuals are able to access social and cultural spaces they might not ordinarily be able to – this then is the gateway to science. As such *Facebook* users may not necessarily intend to communicate with science, but by virtue of the broad and informal means of communiqué may choose to do so. That their engagement in a medialized sense is the consequence of controversy is arguably

irrelevant. What is of greatest significance is that SNS not only brings science to *Facebook* users but fosters dialogue. In this way learning is arguably and paradoxically, both incidental and highly planned.

SNS contributes in building a wider, critical community able to challenge, critique and deconstruct dominant accounts of knowledge, with the advantage of multiple perspectives. In this way, SNS fosters not only a more active, participatory citizenry but allows representations of knowledge, and specifically scientific knowledge, to become democratically shared and constructed.

Conclusions

SNS are informational and relational gateways. They are structured, in unintended or purposeful ways, by often unobservable and latticed learning pathways that disclose fuller understanding of the social, cultural and political world. The web, albeit as an inadvertent, online classroom, is host for dialogical exchange, applying media networking tools which are non-hierarchical, inclusive and fundamentally interactive. A multitude of knowledge industries, universities and museums perhaps most prominently, have identified the potential of the social networking phenomenon as an effective and essential way with which to communicate with a diverse range of audiences. Critically however, this communication is not uni-directional, instructional or even didactic, but shared and open. It offers an invitation for the meeting and exchange of perspectives, affecting and affirming the cross-fertilisation of ideas and the production of knowledge. In this instance understandings of science are enriched by a plurality of viewpoints, held in a parity of esteem, without discrimination and prejudice. This ultimately might unite the traditional incumbent of expertise – academic researcher / scientist with the multifarious public.

SNS offer the potential for publics to become not only better acquainted with the work of scientists stimulating greater transparency and accountability, but also the opportunity to become embedded as active contributors to scientific research and debate. Davies[60] comments that:

> As articulation occurs within these contexts, diverse – indeed often incommensurable – worlds are described and understood and negotiated.

SNS thus, as a means of social learning, enable a more effective and empowered citizenry, building visible links, scaffolding communities-in-dialogue and enriching understandings through multiple, often unrelated perspectives. In using a variety of media tools with which to relay attitudes and opinions, 'the public' may be accredited as directors, supervising the evolution of 'expertise' and the production of new forms of scientific knowledge. Integral to this experience however is a humanistic focus and the expression of an emotional, expressive and empathetic subjectivity. Science *blogs* such as the Guardian newspaper's 'Science Weekly' demonstrate such tendency. Recent discussion around climate change talks in Copenhagen resulted in the appearance of the following comments:

> THE POLITICIANS HAVE FAILED US - TIME FOR THE PEOPLE TO TAKE ACTION IN ORDER TO PREVENT MASSIVE IRREVERSIBLE CLIMATE CHANGE!
> A great victory for truth! I applaud the world for turning its back on this fraud[61]

Both of these excerpts demonstrate an emotional investment in matters of scientific concern and may be said to characterise how scientific debates are framed in the public imagination.

The benefits and contribution of Web 2.0 to education and the learning of science are impossible to ignore or resist. Online participatory networks are not only changing the learning interface but the generation of knowledge itself, raising substantive questions not least in respect of social cognitive (under)development and (mal)adaptation. In democratising the production of knowledge, the reliability and validity of scientific knowledge is potentially compromised. Popularised constructions of knowledge must therefore remain open to moderation and censure to protect against false and ingenuous claims. The vastness and openness of the web however, results in policing of knowledge materials becoming impossibly difficult to manage. I argue however, that the ascent of Web 2.0 is accompanied with increasingly skilled browsers able to distinguish between factual and fictitious knowledge claims. The online knowledge commuter is therefore ably equipped to interact and contribute within a knowledge network where learning is not consciously but actively processed. Nevertheless the SNS user must behave as a conscientious, responsible user/generator of online knowledge.

Social Network Science may be interpreted as a platform for what Kolb[62] calls the 'transactional relationship', an interpenetrating arrangement between the individual and his or her environment, from which new and constantly up-dated social realities emerge. As a form of experiential learning, SNS can transform the abstract into the concrete and thus make science all the more available and known. Kukla[63] comments that only with active participation and activity work are individuals able to form a sense of their own reality. Through interaction people invent the world. Through inventive interaction scientific literacy may flourish.

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Author

Dr Richard Watermeyer is a Research Fellow at Cardiff University working on a public engagement initiative entitled 'The Beacon for Wales'. He is a trained educational sociologist whose research interests span subjectivity and identity formation, innovative pedagogy, experiential learning, cultural theory, the public understanding of science, and ethnography. Dr Watermeyer is currently exploring the diverse theoretical and practical aspects of engagement, developing methodological frameworks and theory for academic practice. He is an affiliate of The ESRC Centre for Economic and Social Aspects of Genomics (Cesagen). E-mail: watermeyerrp@cf.ac.uk.

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